

No.

200800159



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Regents of the University of Minnesota

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR PROPAGATING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE FOREGOING PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Cromwell'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this eleventh day of August, in the year two thousand and eight.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

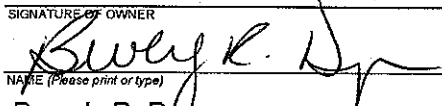
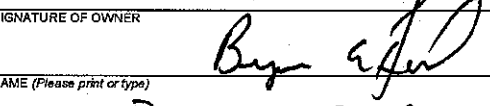
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER Regents of the University of Minnesota		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME MN00261-4	3. VARIETY NAME Cromwell
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) 277 Coffey Hall, 1420 Eckles Ave. University of Minnesota St. Paul, MN 55108		5. TELEPHONE (include area code) 612-624-2299	FOR OFFICIAL USE ONLY PVPO NUMBER #200800159 FILING DATE MARCH 11, 2008
		6. FAX (include area code) 612-625-1260	
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) University	8. IF INCORPORATED, GIVE STATE OF INCORPORATION	9. DATE OF INCORPORATION	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) James A. Anderson Dept. of Agronomy & Plant Genetics, 411 Borlaug Hall 1991 Buford Circle, University of Minnesota St. Paul, MN 55108			F E E S R E C E I V E D FILING AND EXAMINATION FEES: \$ 4,382.00 DATE 3/11/08 CERTIFICATION FEE: \$ 768.00 DATE 7/28/08
11. TELEPHONE (include area code) 612-625-9763	12. FAX (include area code) 612-625-1268	13. E-MAIL ander319@umn.edu	
14. CROP KIND (Common Name) Wheat	15. FAMILY NAME (Botanical) Gramineae	16. DOES THE VARIETY CONTAIN ANY TRANSGENES? (OPTIONAL) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION.	
17. GENUS AND SPECIES NAME OF CROP Triticum aestivum	18. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Exhibit F. Declaration Regarding Deposit g. <input checked="" type="checkbox"/> Voucher Sample (3,000 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) h. <input checked="" type="checkbox"/> Filing and Examination Fee (\$4,382), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(e) of the Plant Variety Protection Act) <input checked="" type="checkbox"/> YES (If "yes", answer items 21 and 22 below) <input type="checkbox"/> NO (If "no", go to item 23) <input type="checkbox"/> UNDECIDED	
		21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input checked="" type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED	
		22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS. <input type="checkbox"/> FOUNDATION <input checked="" type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED (If additional explanation is necessary, please use the space indicated on the reverse.)	
23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)		24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)	
25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF OWNER 		SIGNATURE OF OWNER 	
NAME (Please print or type) Beverly R. Durgan		NAME (Please print or type) Bryan E. Gervel	
CAPACITY OR TITLE Director - MAES	DATE 01/30/08	CAPACITY OR TITLE President - JG&E Inc	DATE 2/5/08

(See reverse for instructions and information collection burden statement)

GENERAL INSTRUCTIONS: To be effectively filed with the Plant Variety Protection Office (PVPO), ALL of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E, F; (3) for a tuber reproduced variety, verification that a viable (in the sense that it will reproduce an entire plant) tissue culture will be deposited and maintained in an approved public repository; and (4) payment by credit card or check drawn on a U.S. bank for \$4,382 (\$518 filing fee and \$3,864 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice). **NEW:** With the application for a seed reproduced variety or by direct deposit soon after filing, the applicant must provide at least 3,000 viable untreated seeds of the variety *per se*, and for a hybrid variety at least 3,000 untreated seeds of each line necessary to reproduce the variety. Partial applications will be held in the PVPO for not more than 90 days; then returned to the applicant as un-filed. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a payment by credit card or check payable to "Treasurer of the United States" in the amount of \$768 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)

Plant Variety Protection Office
 Telephone: (301) 504-5518 FAX: (301) 504-5291
 General E-mail: PVPOmail@usda.gov
 Homepage: <http://www.ams.usda.gov/science/pvpo/PVPindex.htm>

SPECIFIC INSTRUCTIONS:

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that the permanent name of the application variety (even if it is a parental, inbred line) has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Programs, Seed Regulatory and Testing Branch, 801 Summit Crossing Place, Suite C, Gastonia, North Carolina 28054-2193 Telephone: (704) 810-8870. <http://www.ams.usda.gov/lsg/seed.htm>.

ITEM

- 19a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
 (2) the details of subsequent stages of selection and multiplication;
 (3) evidence of uniformity and stability; and
 (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
 (1) identify these varieties and state all differences objectively;
 (2) attach replicated statistical data for characters expressed numerically and demonstrate that these are clear differences; and
 (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
20. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (See Regulations and Rules of Practice, Section 97.103).
23. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
24. See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.

22. CONTINUED FROM FRONT (Please provide a statement as to the limitation and sequence of generations that may be certified.)

Two generations of Certified Seed production are allowed under emergency situations with the consent of the originating breeder or institution.

23. CONTINUED FROM FRONT (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)

First date of sale was March 31, 2007 in the U.S. for certified seed production.

24. CONTINUED FROM FRONT (Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

EXHIBIT A - ORIGIN AND BREEDING HISTORY**'Cromwell'*****Selection Criteria:*****Pedigree: MN95286/MN94155//VERDE**

MN95286 = MN90092/MN86165

MN90092 = Stoa/78039-14-3-2-1//MN85120

78039-14-3-2-1 = Era/3/II-60-105/RR646//III-67-7/NS732

II-60-105 = Pembina/(Frontana/Thatcher)

III-67-7 = Fundelea 10-71//NE 74736/MN72316

MN72316 = Era/TOB//Lovrin #11

MN85120 = Era/PS 3742

MN86165 = MN81135/MN80030

MN81135 = MN7310/MN7439

MN73110 = Era/3/II-60-105/RR646//III-67-7/NS732

MN7439 = PK*2/3/Pi62/Chris "s"//SON/4/Kitt/5/(Flet/Nor66//Thatcher/Sapreza)/
(Frontana//Kenya58/Newthatch)/(Pembina//Frontana/Thatcher)

MN80030 = M7142/Era

M7142 = Chris*3//Pembina/Frontana/5*Thatcher//[(Frontana/Thatcher)/Mida/
Kenya 117a)]/(Lee//Kenya 58/Newthatch)

MN94155 = SBF0230/MN86151

SBF0230 = Coteau/SBY430A

SBY430A = Waldron/Era//Arg 9/3/W6753

MN86151 = WHEATON/MN81129

MN81129 = MN72299/MN7438

MN72299 = [(Frontana/Thatcher)/(Mida/Kenya 117a)]/(Lee//Kenya58/Newthatch)

MN7438 = PK*2/3/Pi62/Chris "s"//SON/4/Kitt/5/(Flet/Nor66//Thatcher/Sapreza)/
(Frontana//Kenya58/Newthatch)/(Pembina//Frontana/Thatcher)

1997: Cross was made and F1 generation grown in University of Minnesota greenhouses in St. Paul, MN.

1998: F2 space-plant population; University of Minnesota research land; segregating for maturity, plant height, and disease resistance, leaf and stem rust resistant plants selected; F3 single seed descent generation advance in New Zealand winter nursery. No selection applied.

1999: F4 head row (F3-derived); University of Minnesota research land; selected based on appropriate plant height, maturity, and leaf and stem rust resistance.

2000: F5 seed increase (from a single spike from the F4 row) grown in Arizona during the winter; no segregation observed within the single row.

2000: F6 Preliminary Yield Trial (tested as MN00261); University of Minnesota research land; selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality; no segregation noted.

- 2001: F7 Advanced Yield Trial (3 locations), University of Minnesota research land; selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality; no segregation noted. Nine random heads harvested and planted in New Zealand.
- 2002: Advanced Yield Trial (3 locations), University of Minnesota research land; selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality; no segregation noted. One random head selection was harvested in New Zealand and designated as MN00261-4. MN00261-4 was increased in St. Paul and 200 random heads selected for purification in 2003.
- 2003: Statewide Variety Trial (7 locations, tested as MN00261-4), University of Minnesota research land, selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality. 160 head selections were grown in St. Paul and 157 selected and combined in bulk.
- 2004: Statewide Variety Trial (7 locations), University of Minnesota research land, Uniform Regional Performance Nursery; U of MN on-farm trials (5 locations); selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality. An increase of MN00261-4 was planted on .33 acres in St. Paul. 950 pounds of seed was produced.
- 2005: Statewide Variety Trial (7 locations), University of Minnesota research land; Uniform Regional Performance Nursery; U of MN on-farm trials (3 locations); selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality. Increase on 10 acres arranged by the Minnesota Crop Improvement Association (Friederichs farm near Foxhome, MN). 590 bushels of seed was produced.
- 2006: Statewide Variety Trial (7 locations), University of Minnesota research land; selected based on appropriate plant height, maturity, field resistance to leaf and stem rust, Fusarium head blight resistance, grain protein content, test weight, grain yield, milling and baking quality. No seed increase this year.
- 2007: Exclusive licensing granted to JGL Inc., Plymouth, IN and named 'Cromwell'.

Evidence of Uniformity and Stability:

MN00261-4 has been uniform and stable since its purification and formation in 2002. Approximately 3 in 10,000 plants are more than 10 cm taller. The frequency of tall plants varies somewhat with the environmental conditions, but has not exceeded 1 in 1,000.

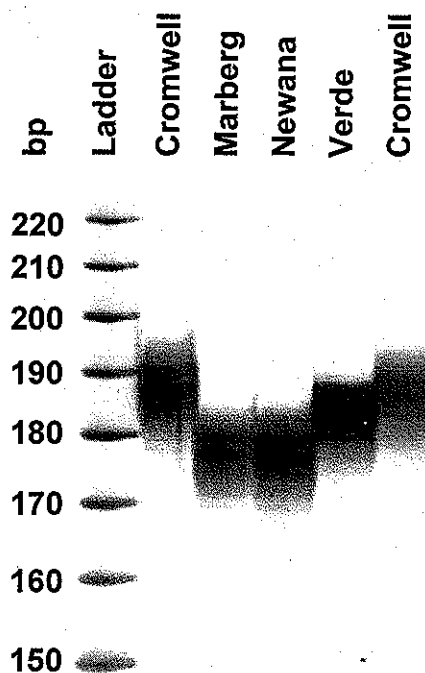
EXHIBIT B. -STATEMENT OF DISTINCTNESS

When grown with other hard red spring wheat varieties in its area of adaptation, Cromwell can be readily distinguished from other varieties by its combination of maturity, plant height, and reaction to leaf rust and Fusarium head blight.

On the basis of genetic relationship and overall plant architecture, Cromwell is most similar to Verde. Cromwell differs from Verde when amplified with the SSR marker gwm44 (see Figure below). Marker gwm44 amplifies a GA repeat and is located on chromosome 7D (Genetics 149:2007-2023). Marker gwm44 also distinguished the varieties 'Marberg' and 'Newana' from Cromwell. Cromwell amplifies a 190 bp fragment with gwm44, compared to 180 bp for Marberg and Newana, and 188 bp for Verde.

SSR	Left Primer	Right Primer
Xgwm44	GTT GAG CTT TTC AGT TCG GC	ACT GGC ATC CAC TGA GCT G

Following methods of Roder et al., 1998. *Genetics* 149:2007-2023.



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To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

**U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705**

Exhibit C

**OBJECTIVE DESCRIPTION OF VARIETY
Wheat (*Triticum* spp.)**

NAME OF APPLICANT (S) Regents of the University of Minnesota	TEMPORARY OR EXPERIMENTAL DESIGNATION MN00261-4	VARIETY NAME Cromwell
ADDRESS (Street and No. or RD No., City, State, Zip Code and Country) 277 Coffey Hall 1420 Eckles Ave. St. Paul, MN 55108		FOR OFFICIAL USE ONLY PVPO NUMBER 200800159

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g., or) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: _____. Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

- 1 = Common
2 = Durum
3 = Club
4 = Other (Specify) _____

2. VERNALIZATION:

- 1 = Spring
2 = Winter
3 = Other (Specify) _____

3. COLEOPTILE ANTHOCYANIN:

- 1 = Absent 2 = Present

4. JUVENILE PLANT GROWTH:

- 1 = Prostrate 2 = Semi-Erect 3 = Erect

5. PLANT COLOR: (boot stage)

- 1 = Yellow-Green
2 = Green
3 = Blue-Green

6. FLAG LEAF: (boot stage)

- 1 = Erect 2 = Recurved
 1 = Not Twisted 2 = Twisted
 1 = Wax Absent 2 = Wax Present

7. EAR EMERGENCE:

- Number of Days (Average)
 Number of Days Earlier Than * Verde
Same As * HJ98
 Number of Days Later Than * Ulen
*Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

8. ANTER COLOR:

- 1 = Yellow 2 = Purple

9. PLANT HEIGHT: (from soil to top of head, excluding awns)

200800159

0 9 5

cm (Average)

0 5

cm Taller Than Ada *Same As Walworth *

0 4

cm Shorter Than Reeder *

10. STEM:

A. ANTHOCYANIN

1

1 = Absent 2 = Present

B. WAXY BLOOM

2

1 = Absent 2 = Present

C. HAIRINESS (last internode of rachis)

1

1 = Absent 2 = Present

D. INTERNODE

1

1 = Hollow 2 = Semi-Solid 3 = Solid

4

Number of Nodes

E. PEDUNCLE

3

1 = Erect 2 = Recurved 3 = Semi-Erect

3 1

cm Length

F. AURICLE

1

Anthocyanin: 1 = Absent 2 = Present

1

Hair: 1 = Absent 2 = Present

11. HEAD: (At Maturity)

A. DENSITY

2

1 = Lax
2 = Middense (Laxidense)
3 = Dense

B. SHAPE

1

1 = Tapering
2 = Strap
3 = Clavate
4 = Other (Specify) _____

C. CURVATURE

2

1 = Erect
2 = Inclined
3 = Recurved

D. AWNEDNESS

4

1 = Awnless
2 = Apically Awnletted
3 = Awnletted
4 = Awned

12. GLUMES: (At Maturity)

A. COLOR

1

1 = White
2 = Tan
3 = Other (Specify) _____

B. SHOULDER

2

1 = Wanting 2 = Oblique
3 = Rounded 4 = Square
5 = Elevated 6 = Apiculate
7 = Other (Specify) _____

C. SHOULDER WIDTH

2

1 = Narrow
2 = Medium
3 = Wide

D. BEAK

3

1 = Obtuse
2 = Acute
3 = Acuminate

E. BEAK WIDTH

2

1 = Narrow
2 = Medium
3 = Wide

F. GLUME LENGTH

2

1 = Short (ca. 7 mm)
2 = Medium (ca. 8 mm)
3 = Long (ca. 9 mm)

G. WIDTH

1

1 = Narrow (ca. 3 mm)
2 = Medium (ca. 3.5 mm)
3 = Wide (ca. 4 mm)

H. PUBESCENCE

2

1 = Not Present
2 = Present

200800159

13. SEED:

A. SHAPE

- ☐ 1 = Ovate
☐ 2 = Oval
☐ 3 = Elliptical

B. CHEEK

- ☐ 2 1 = Rounded
 2 = Angular

C. BRUSH

- ☐ 2 1 = Short
 2 = Medium
 3 = Long
- ☐ 1 = Not Collared
☐ 2 = Collared

D. CREASE

- ☐ 1 1 = Width 60% or less of Kernel
 2 = Width 80% or less of Kernel
 3 = Width Nearly as Wide as Kernel

- ☐ 2 1 = Depth 20% or less of Kernel
 2 = Depth 35% or less of Kernel
 3 = Depth 50% or less of Kernel

E. COLOR

- ☐ 3 1 = White
 2 = Amber
 3 = Red
 4 = Other (Specify) _____

F. TEXTURE

- ☐ 1 1 = Hard
 2 = Soft
 3 = Other (Specify) _____

G. PHENOL REACTION (See Instructions)

- ☐ 0 1 = Ivory
 2 = Fawn
 3 = Light Brown
 4 = Dark Brown
 5 = Black

H. SEED WEIGHT

- ☐ 3 ☐ 3 g/1000 Seed (whole number only)

I. GERM SIZE

- ☐ 3 1 = Small
 2 = Midsize
 3 = Large

14. DISEASE: PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

(0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

- | | |
|---|---|
| <input type="checkbox"/> 2 Stem Rust (<i>Puccinia graminis</i> f. sp. <i>tritici</i>) | <input type="checkbox"/> 3 Leaf Rust (<i>Puccinia recondita</i> f. sp. <i>tritici</i>) |
| <input type="checkbox"/> 2 Stripe Rust (<i>Puccinia striiformis</i>) | <input type="checkbox"/> 0 Loose Smut (<i>Ustilago tritici</i>) |
| <input type="checkbox"/> 3 Tan Spot (<i>Pyrenophora tritici-repentis</i>) | <input type="checkbox"/> 0 Flag Smut (<i>Urocystis agropyri</i>) |
| <input type="checkbox"/> 0 Halo Spot (<i>Selenophoma donacis</i>) | <input type="checkbox"/> 0 Common Bunt (<i>Tilletia tritici</i> or <i>T. laevis</i>) |
| <input type="checkbox"/> 0 <i>Septoria nodorum</i> (Glume Blotch) | <input type="checkbox"/> 0 Dwarf Bunt (<i>Tilletia controversa</i>) |
| <input type="checkbox"/> 0 <i>Septoria avenae</i> (Speckled Leaf Disease) | <input type="checkbox"/> 0 Karnal Bunt (<i>Tilletia indica</i>) |
| <input type="checkbox"/> 0 <i>Septoria tritici</i> (Speckled Leaf Blotch) | <input type="checkbox"/> 2 Powdery Mildew (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>) |
| <input type="checkbox"/> 3 Scab (<i>Fusarium</i> spp.) | <input type="checkbox"/> 0 "Snow Molds" |
| <input type="checkbox"/> 2 "Black Point" (Kernel Smudge) | <input type="checkbox"/> 0 Common Root Rot (<i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.) |
| <input type="checkbox"/> 0 Barley Yellow Dwarf Virus (BYDV) | <input type="checkbox"/> 0 Rhizoctonia Root Rot (<i>Rhizoctonia solani</i>) |
| <input type="checkbox"/> 0 Soilborne Mosaic Virus (SBMV) | <input type="checkbox"/> 2 Black Chaff (<i>Xanthomonas campestris</i> pv. <i>translucens</i>) |
| <input type="checkbox"/> 0 Wheat Yellow (Spindle Streak) Mosaic Virus | <input type="checkbox"/> 2 Bacterial Leaf Blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>) |
| <input type="checkbox"/> 0 Wheat Streak Mosaic Virus (WSMV) | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Other (Specify) _____ | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Other (Specify) _____ | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> Other (Specify) _____ | <input type="checkbox"/> Other (Specify) _____ |

15. INSECT: (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

- | | |
|--|--|
| <input type="checkbox"/> 0 Hessian Fly (<i>Mayetiola destructor</i>) | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> 0 Stem Sawfly (<i>Cephus</i> spp.) | <input type="checkbox"/> Other (Specify) _____ |
| <input type="checkbox"/> 0 Cereal Leaf Beetle (<i>Oulema melanopa</i>) | <input type="checkbox"/> Other (Specify) _____ |

15. INSECT: (continued) (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

200800159

PLEASE SPECIFY BIOTYPE (Where Needed)

☐Russian Aphid (*Diuraphis noxia*)☐

Other (Specify) _____

☐Greenbug (*Schizaphis graminum*)☐

Other (Specify) _____

☐

Aphids

☐

Other (Specify) _____

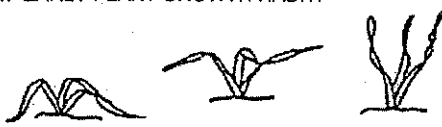

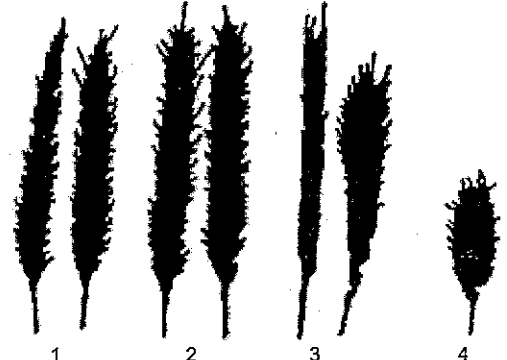

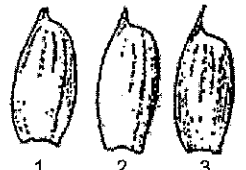
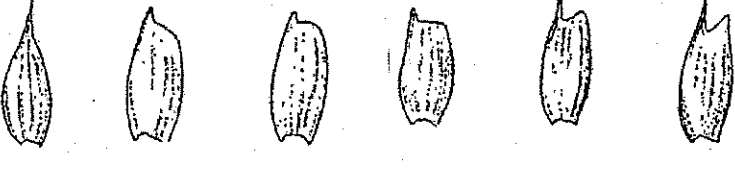


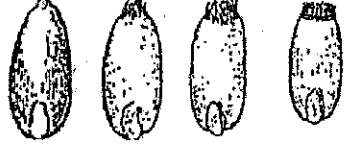
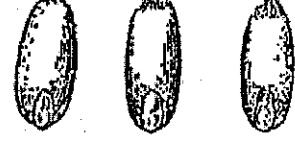



16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

WHEAT DESCRIPTOR ILLUSTRATIONS

Exhibit C (Wheat)

Section Numbers Correspond to the Numbers of the Sections on the Form

200800159

<p>4. EARLY PLANT GROWTH HABIT:</p>  <p>1 Prostrate 2 Intermediate 3 Erect</p>	<p>10. (D.) STEM INTERNODE X-SECTION:</p>  <p>1 Hollow 2 Semi-solid 3 Solid</p>	<p>11. (B.) SPIKE SHAPE:</p>  <p>1 Tapering 2 Oblong 3 Clavate 4 Elliptical</p>	
<p>11. (D.) AWNEDNESS:</p>  <p>1 Awnless 2 Apically Awnleted 3 Awnleted 4 Awned</p>	<p>12. (D.) BEAK SHAPE:</p>  <p>1 Obtuse 2 Acute 3 Acuminate</p>		
<p>12. (C.) SHOULDER SHAPE:</p>  <p>1 Wanting 2 Oblique 3 Rounded 4 Square 5 Elevated 6 Apiculate</p>			
<p>13. (A.) SEED SHAPE:</p>  <p>1 Ovate 2 Oval 3 Elliptical</p>	<p>13. (B.) CHEEK SHAPE:</p>  <p>1 Rounded 2 Angular</p>	<p>13. (C.) BRUSH SIZE:</p>  <p>1 Small 2 Midsized 3 Large 4 Collared</p>	<p>13. (C.) BRUSH HAIR LENGTH:</p>  <p>1 Short 2 Medium 3 Long</p>
<p>13. (I.) GERM (EMBRYO) SIZE:</p>  <p>1 Small 2 Midsized 3 Large</p>	<p>13. (D.) SEED CREASE WIDTH:</p>  <p>1 Narrow 2 Mid-wide 3 Wide</p>	<p>13. (D.) SEED CREASE DEPTH:</p>  <p>1 Shallow 2 Mid-Deep 3 Deep</p>	

#200800159

EXHIBIT D. – ADDITIONAL DESCRIPTION OF VARIETY

Table 1. Characteristics of MN00216-4 and selected wheat varieties.

Variety	Year Released/ Origin	Days to Heading ¹	Height cm ¹	Straw strength ²	Test Weight (Lb/Bu) 2004	Test Weight (Lb/Bu) 2 yr.	Protein (%) ³ 2004	Protein (%) ³ 2 yr.	Baking Quality ⁴	Pre-Harvest Sprouting
Alsen	2000 NDSU	67.1	92	strong	60.5	61.6	14.9	15.1	high	Resistant
HJ98	1998 UMN	68.3	91	medium	57.9	59.8	14.0	14.1	med.-low	Resistant
Ingot	1998 SDSU	64.9	101	medium	61.9	63.0	14.2	14.7	med.-high	Susceptible
Knudson	2001 AgriPro	68.3	94	m. strong	59.9	61.1	14.0	14.0	med.-high	Resistant
MN00261-4	2007 UMN	69.0	95	m. strong	61.1	62.1	14.3	14.6	med.-high	Resistant
Ada	2006 UMN	67.8	90	m. strong	61.1	62.4	14.6	15.0	med.-high	Resistant
Ulen	2004 UMN	65.8	96	medium	60.2	61.3	14.8	15.1	med.-high	Mod. Resistant
Oklee	2003 UMN	65.6	89	medium	61.0	62.2	14.9	15.1	low-med.	Resistant
Oxen	1995 SDSU	66.5	93	m. strong	57.7	59.8	14.4	14.5	high-med.	Resistant
Reeder	1999 NDSU	67.6	99	strong	59.8	61.1	14.4	14.6	med.-high	Resistant
Verde	1995 UMN	70.0	91	m. strong	59.5	60.5	13.8	13.9	low-med.	Resistant
Walworth	2001 SDSU	65.4	96	medium	58.8	60.2	14.4	14.7	med.-high	Resistant
Mean		67	94		60.0	61.3	14.4	14.6		

1. 2004 data. Days to heading is approximate because not all locations are included

2. 2000-2004 data.

3. 12% moisture basis.

4. 2001-2003.

#200800159

Table 2. Grain end-use quality of Cromwell and other hard red spring wheat cultivars grown in Minnesota, 2004 and 2006. Data provided by the USDA Spring Wheat Quality Laboratory, Fargo, ND.

Cultivar	1,000 Kernel		Grain		Flour		Bake Mix		Bake ABS		Loaf volume cc
	Weight g	NIR	Hardness	Grain Protein g kg ⁻¹	Extraction %	Flour protein g kg ⁻¹	Bake Mix min.	Bake g kg ⁻¹	Loaf volume cc		
Ada	33.7	61.2		141.7	59.5	130.5	2.9	58.4	192.0		
Alsen	32.9	62.9		144.7	60.0	132.7	3.1	58.4	196.7		
Briggs	33.6	62.6		145.8	60.9	136.2	2.3	57.2	192.0		
Freyr	32.2	60.2		143.3	59.6	133.2	2.5	57.0	192.3		
Glenn	33.5	61.1		146.3	58.1	136.7	3.4	58.2	193.8		
Granger	37.7	62.9		145.7	60.2	134.0	2.5	59.2	195.0		
Granite	32.1	59.1		152.5	58.1	144.7	2.7	57.5	203.8		
Knudson	35.1	63.0		137.5	59.4	122.7	4.0	57.8	177.5		
Marshall	29.6	53.8		131.7	60.8	123.8	2.3	54.9	183.3		
Cromwell	32.6	62.9		141.0	60.3	128.8	4.3	58.4	187.2		
Oklee	33.8	57.0		144.3	59.9	136.2	2.3	56.6	193.8		
Oxen	31.9	64.4		136.5	63.0	123.8	3.3	57.3	190.7		
RB07	31.5	58.4		142.2	59.1	132.3	3.2	57.7	195.5		
Reeder	33.7	53.8		140.7	58.6	132.0	2.3	56.5	190.7		
Steele-ND	34.4	68.8		147.3	61.1	135.8	2.7	58.9	206.0		
Ulen	36.0	57.7		142.3	60.8	131.3	2.3	56.8	200.7		
Walworth	31.5	58.4		142.7	62.1	129.8	3.6	55.5	186.0		
Mean	33.3	60.5		142.7	60.1	132.0	2.9	57.4	192.8		
LSD (0.05)	2.1	7.2		7.3	2.3	8.2	0.6	1.7	11.2		
Location-years	6	6		6	6	6	6	6	6		

200800159

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

**EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP**

1. NAME OF APPLICANT(S) Regents of the University of Minnesota	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER MN00261-4	3. VARIETY NAME Cromwell
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) 277 Coffey Hall, 1420 Eckles Ave. University of Minnesota St. Paul, MN 55108	5. TELEPHONE (Include area code) 612-624-2299	6. FAX (Include area code) 612-625-1260
7. PVPO NUMBER 200800159		

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain. ☐ YES ☒ NOThe marketing rights in the United States for Cromwell have been licensed to:
JGL Inc., 1550 Pidco Drive, Plymouth, IN 465639. Is the applicant (individual or company) a U.S. national or a U.S. based company? If no, give name of country. ☒ YES ☐ NO10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

☐ YES ☐ NO If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 5 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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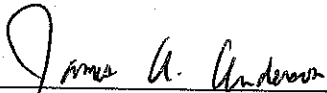
To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.


U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S) Regents of the University of Minnesota	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country) 277 Coffey Hall, 1420 Eckles Ave. University of Minnesota St. Paul, MN 55108	TEMPORARY OR EXPERIMENTAL DESIGNATION MN00261-4
NAME OF OWNER REPRESENTATIVE (S) James A. Anderson	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country) 277 Coffey Hall, 1420 Eckles Ave. University of Minnesota St. Paul, MN 55108	VARIETY NAME Cromwell FOR OFFICIAL USE ONLY PVPO NUMBER #200800159

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.


Signature


Date